Korea's Energy Transition

Status and Strategies

19 June 2020

Sangjun Lee

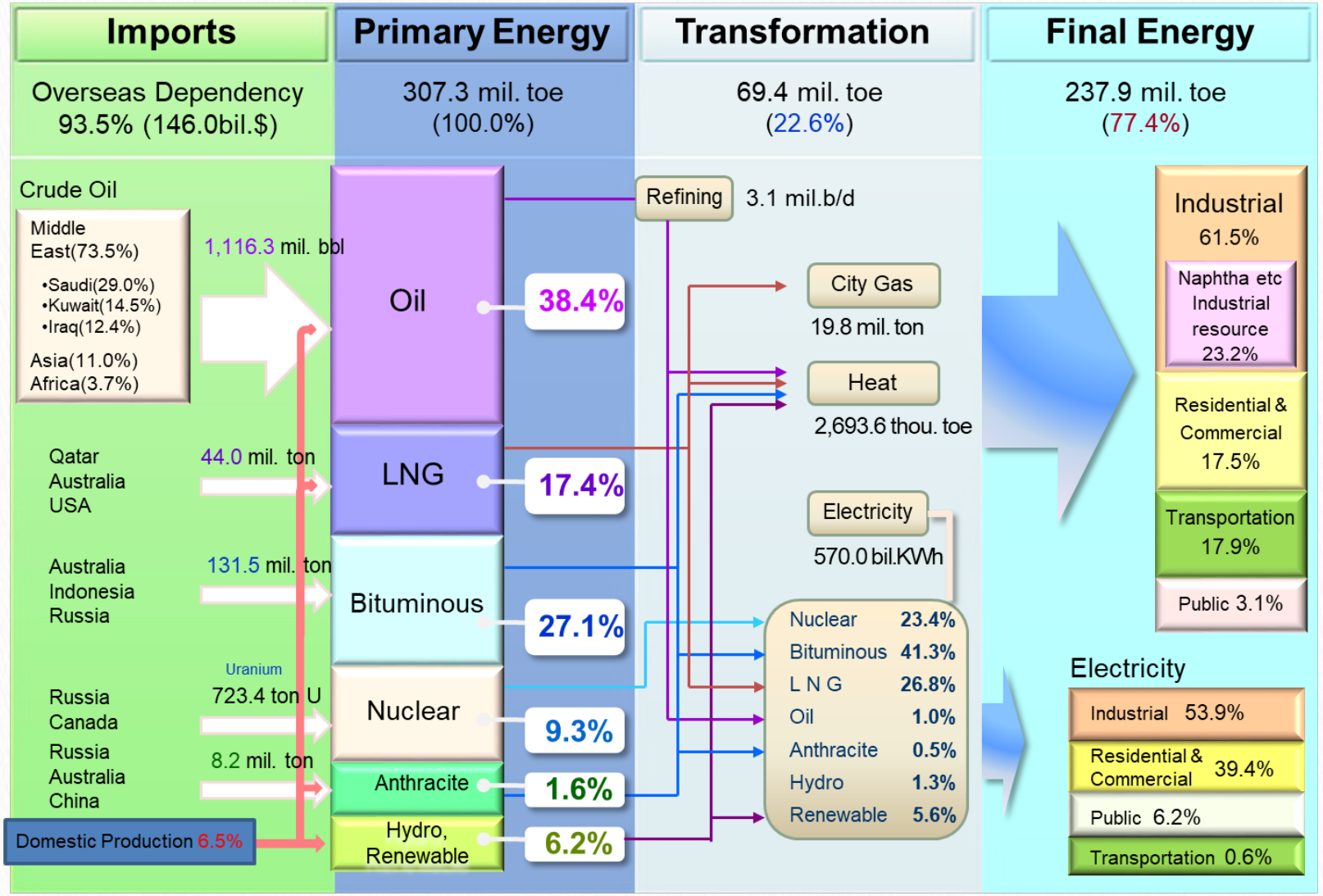
에너지경제연구원
Korea Energy Economics Institute

Current Status

에너지경제연구원
Korea Energy Economics Institute

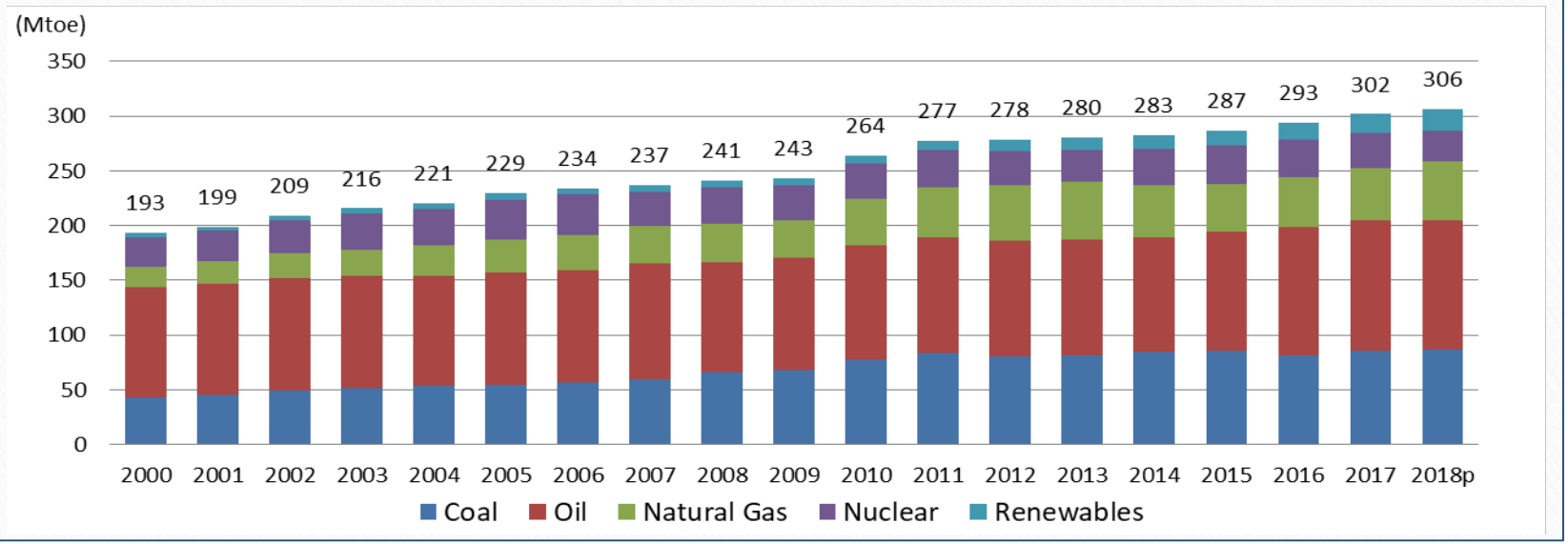
Energy Balance

2017

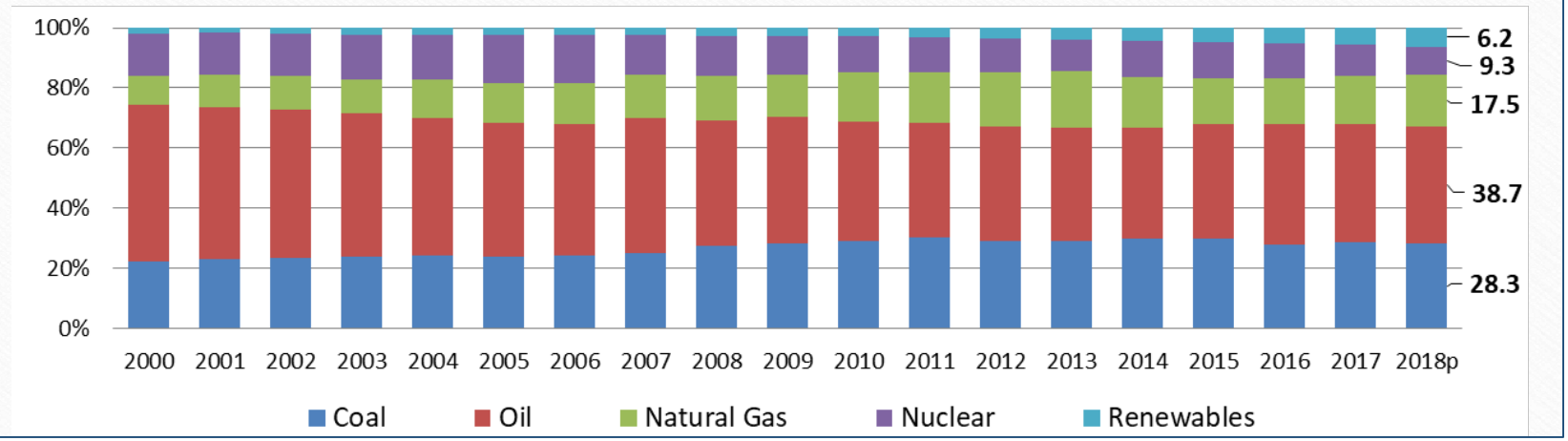


Total Primary Energy Supply

Cumulative

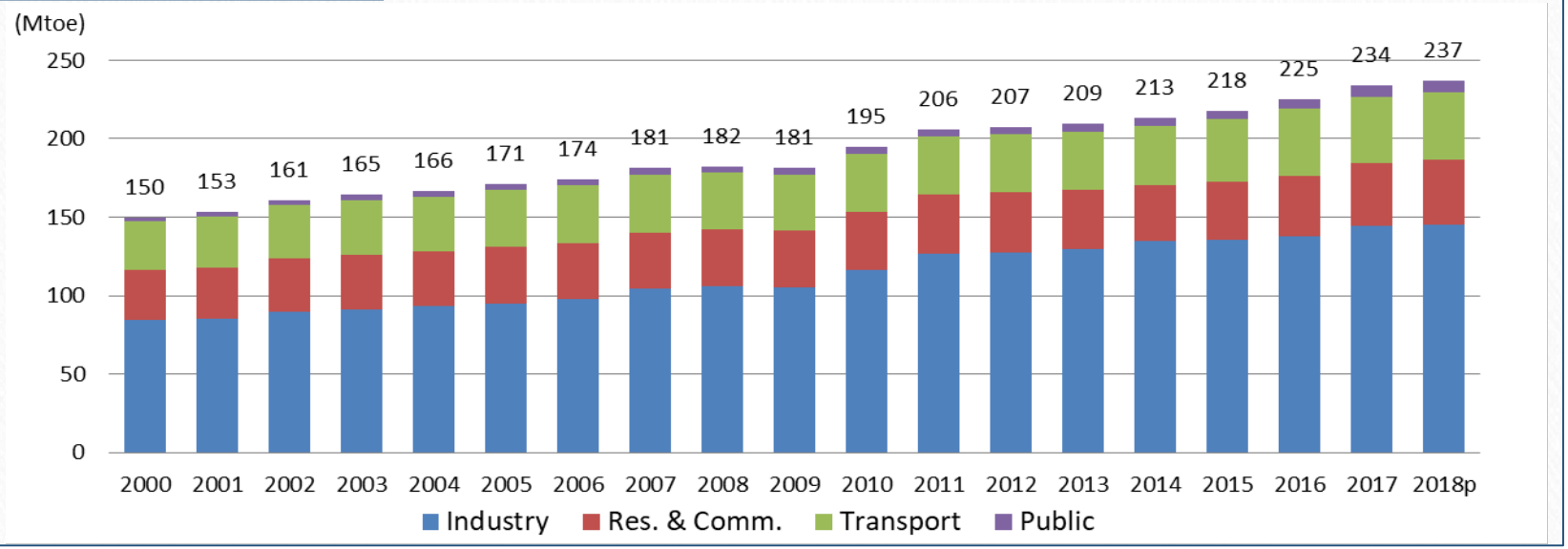


Proportion

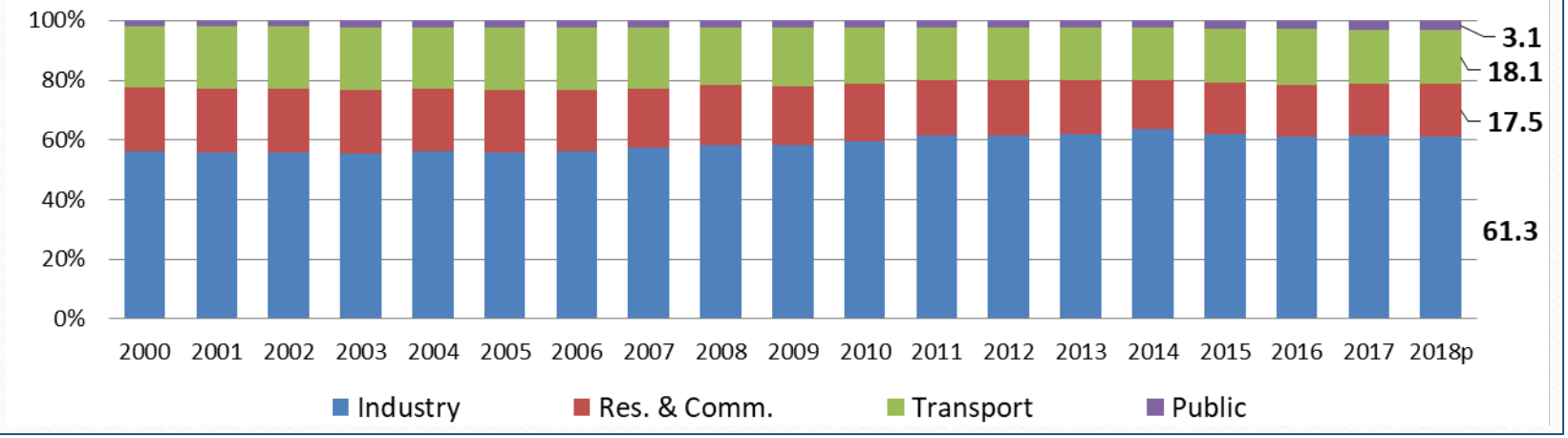


Final Energy Consumption

Cumulative

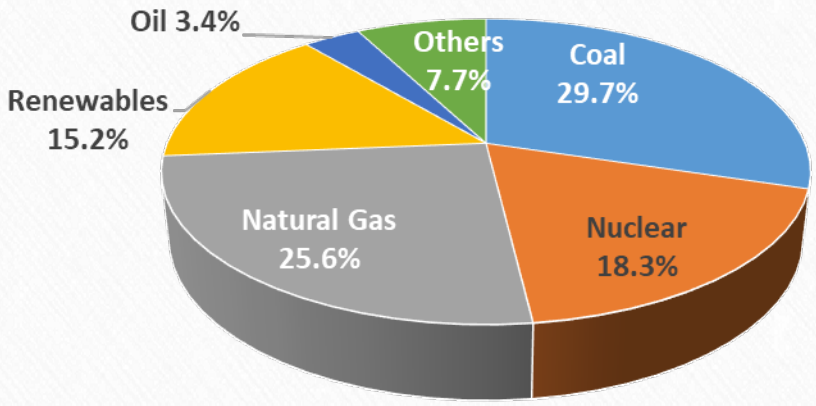


Proportion



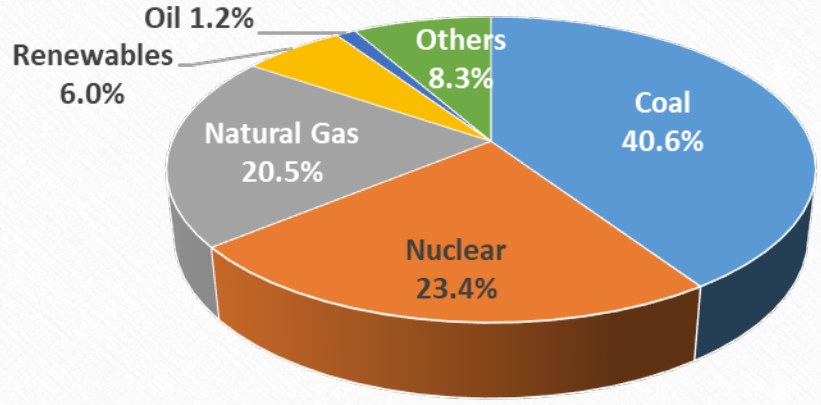
Power Generation Mix (’18)

Generation Capacity



- Total capacity: 119.1GW (2018)
- Fossil fuel: 65.9GW (55.9%)
- Nuclear reactors in operation: 25

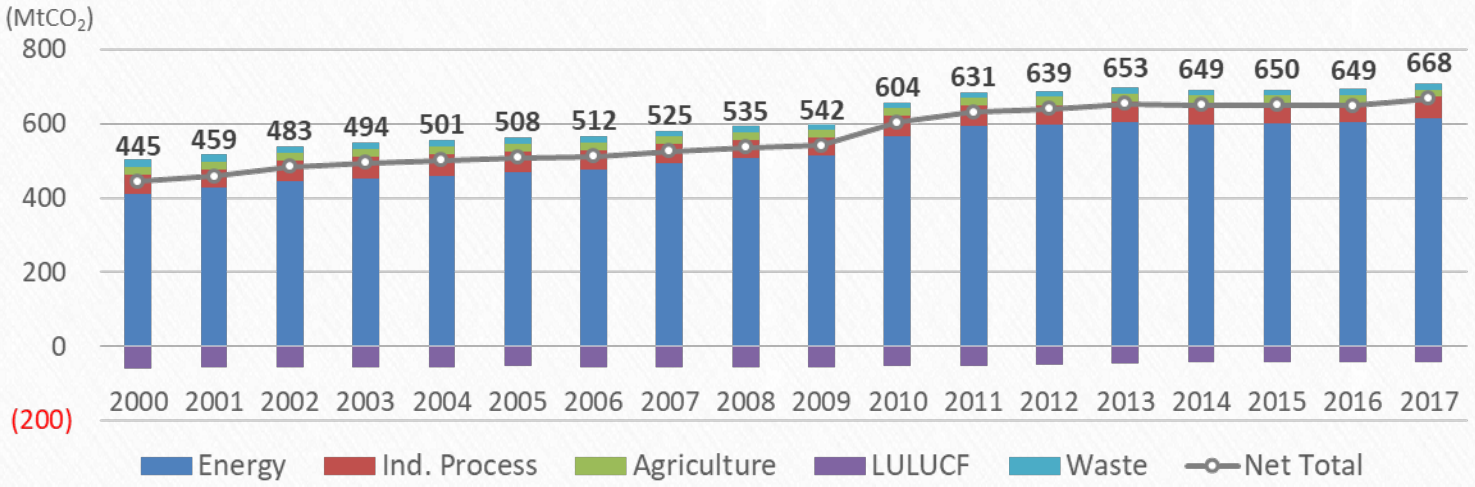
Electricity Production



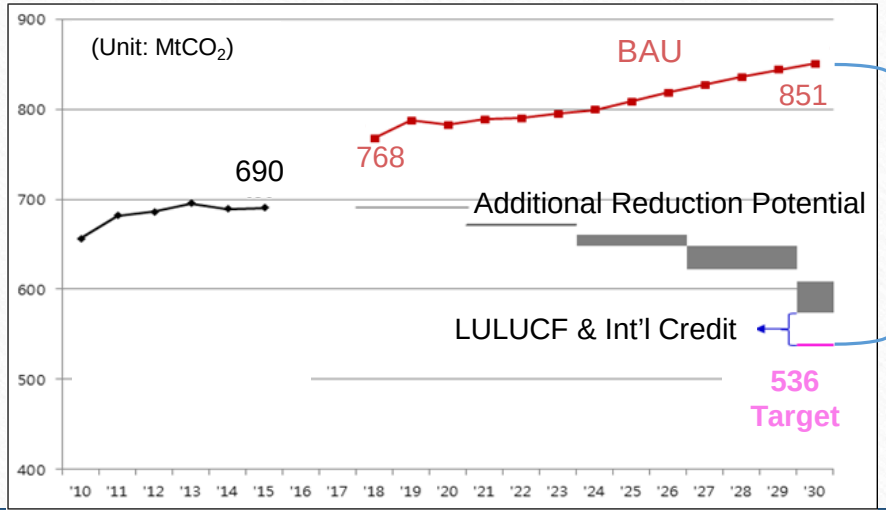
- Total production: 570.1TWh (2018)
- Base-load fuel (coal, nuclear): 64.0%

Greenhouse Gas Emissions

National Inventory



Nationally Determined Contribution



-37% from BAU

- Revised in 2018 to enhance domestic GHG reduction
- Additional efforts in power sector & newly accounted LULUCF
- Int'l credit: 11.3% ('15) → 1.9%

Paradigm Shift: Innovation of Consumption Structure

에너지경제연구원
Korea Energy Economics Institute

Demand Outlook and Target

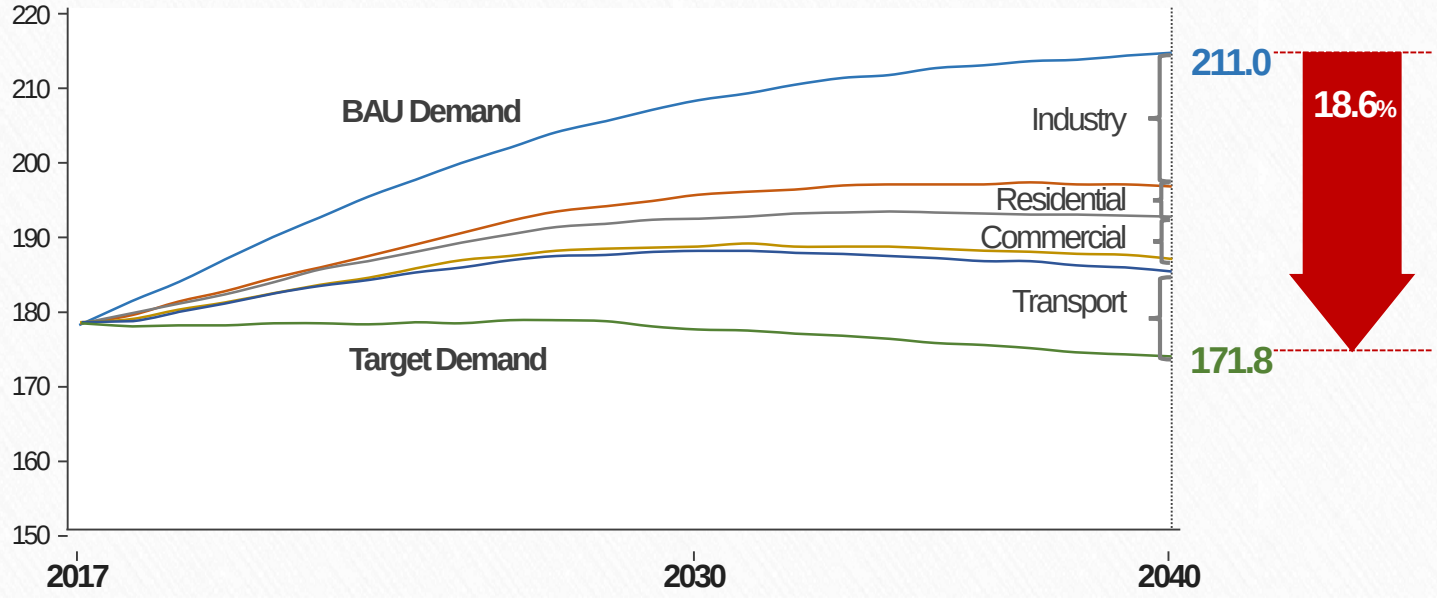
Demand Outlook

- **Final energy:** 211.0Mtoe (2040) with annual average of 0.8% ↑
  Energy intensity for final energy consumption: annual average of 1.2% ↓

Target Demand

- Reduce **final energy consumption** by 18.6% compared to the BAU demand
  Improve **energy intensity for final energy consumption** by 38%

[BAU and Target Demand for Final Energy (draft)]



Demand Outlook and Target

Target Demand

- **Oil products:** 31.1% decrease against BAU (vehicle fuel efficiency, EVs & FCEVs)
  Renewables: 19.9% ↑ from BAU due mainly to distributed generation for self-consumption

[Demand Target for Final Energy: Sources] (Mil. TOE, Exc. Consumption for feed stock)

	Coal	Oil	City gas	Renewables	Electricity	Heat Energy	Total
2017	33.2	61.4	23.7	11.8	43.7	2.3	**176.0**
2030	32.3	47.8	25.4	18.8	49.0	2.0	**175.3**
2040	31.2	39.4	26.1	23.8	49.7	1.6	**171.8**
(BAU)	*39.0*	*57.1*	*30.5*	*19.9*	*61.8*	*2.6*	***211.0***

- **Industry:** 15% decrease from BAU (economy-wide ETS, GHG target management, etc.)
  Transport: 25.4% reduction (higher fuel efficiency of road, air, sea; larger share of mass transit)

[Demand Target for Final Energy: Sectors] (Mil. TOE, Exc. Consumption for feed stock)

	Industry	Residential	Commercial	Public	Transport	Total
2017	87.4	22.2	17.6	6.4	42.5	**176.0**
2030	94.7	19.1	18.4	6.8	36.2	**175.3**
2040	96.3	17.7	18.5	6.6	32.7	**171.8**
(BAU)	*113.3*	*21.9*	*23.9*	*8.0*	*43.8*	***211.0***

Demand Management

Industry

- Voluntary annual 1% reduction of energy intensity for heavy consumers (2,000 TOE ↑)
- More FEMS installation
- Replacements with high-efficiency equipment (ex. boilers)

Energy intensity (TOE/$1,000, value-added)

2017	2040
0.150	0.119

21%

Building

- Mandatory efficiency assessment for public/commercial buildings (3,000 ㎡ ↑)
- Stronger building insulation/installation standards & more BEMS installation
- No fluorescent lights in the market (2028)

Energy intensity for industry and the public (TOE/$1,000)

2017	2040
0.029	0.018

38%

Transportation

- Fuel efficiency target for heavy duty vehicles
- Improved fuel efficiency target for passenger vehicles
- 8.3 million electric vehicles and 2.9 million hydrogen vehicles by 2040
- Intelligent Transportation System (ITS) & efficiency of non-road transportation

Average fuel efficiency (km/ℓ)

	2017	2040
Passenger vehicle	16.8	35.0
Heavy duty vehicle	5.19	7.5

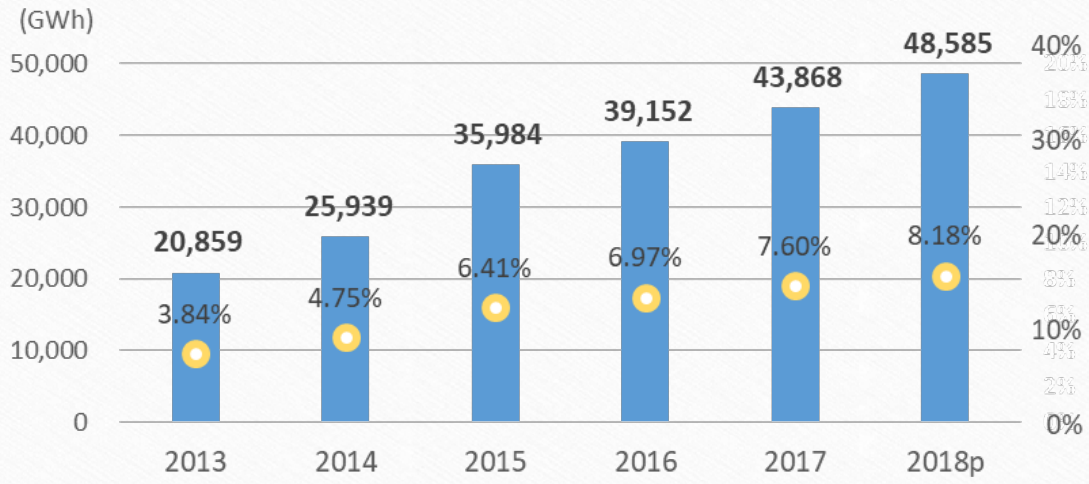
1.5-2 times

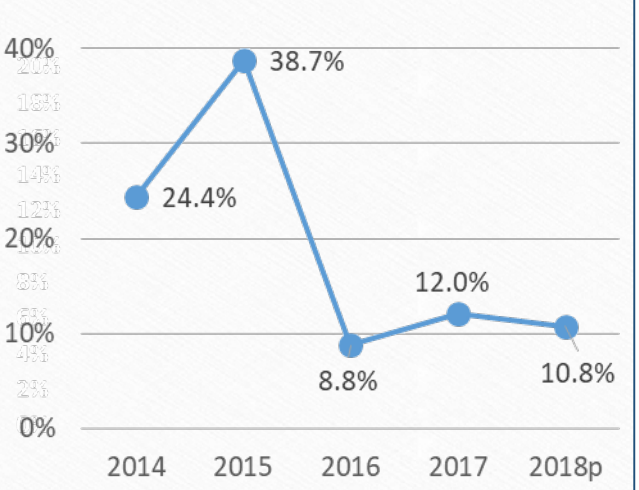
Transition to Clean and Safe Energy Mix

에너지경제연구원
Korea Energy Economics Institute

Renewable Energy

Recent Progress



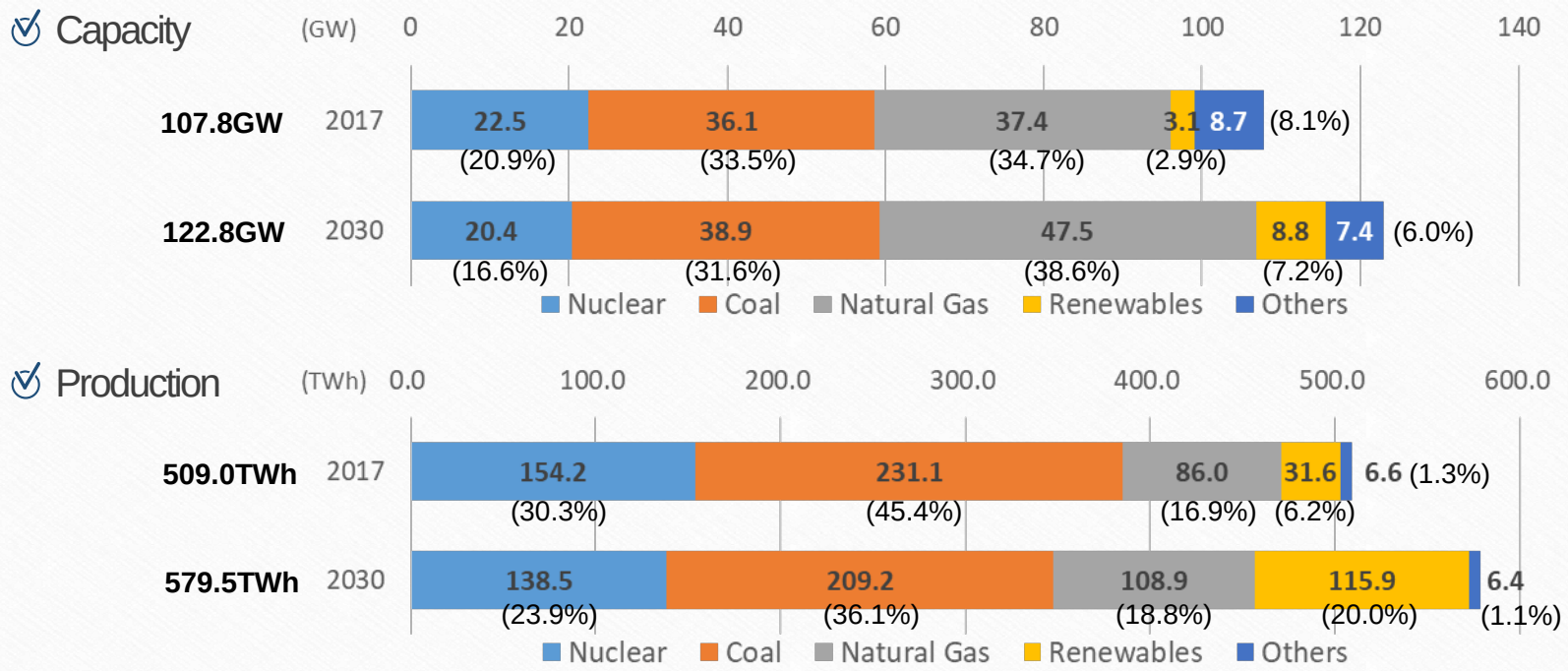


Renewable Portfolio Standard

- Power generation companies of 500+MW capacity must supply a proportion of their electricity out of renewable energy sources (6.0% this year)
- Target is being raised by 1.0% annually up to 10% (from 4.0% in 2017 to 10.0% in 2023)

Power Generation Mix

2030 Target



Renewable Energy

2040 Target: 30~35% (range) of Power Generation

- Changes possible in the future (ex. technological development, public acceptance)

Sustainable Energy Mix

Coal	Phase-out: no new plants & early retirement if necessary
Natural Gas	↑ role as a source for power generation Demand diversification
Nuclear Power	Phase-out: no lifespan extension & no new plants
Oil	↓ role as a transportation fuel ↑ use as a feedstock for petrochemicals
Hydrogen	Groundwork to develop it as an important source

Energy Security through Global Cooperation

Energy Import Diversification

- Continuous diversification of oil import supply & more storage facilities for commercial use
- Natural gas portfolio diversification: source, pricing, contract length, etc.

Overseas Resources Development Innovation

- Public enterprises: restructuring of financial structure and decision making process
- Support for private-sector capacity building (ex. financing, R&D, manpower development)

Northeast Asia Super Grid

- South Korea-North Korea-Russia: joint study between S. Korea and Russia (~2020)
- Korea-China-Japan interconnector: MOU or joint study in a bilateral manner

Northeast Asia Cooperation on Natural Gas

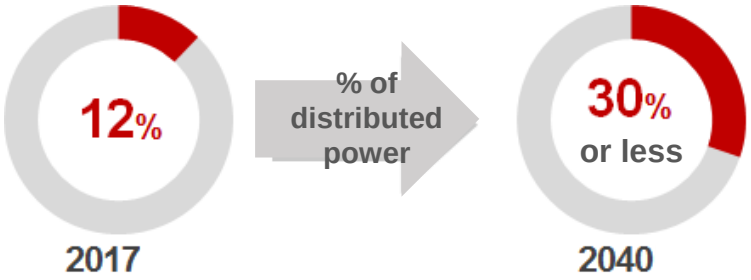
- Less rigid contract conditions, joint stock in case of supply emergency, more swap trade
- Natural gas pipeline connection in Northeast Asia

Expansion of Distributed & Participatory Energy System

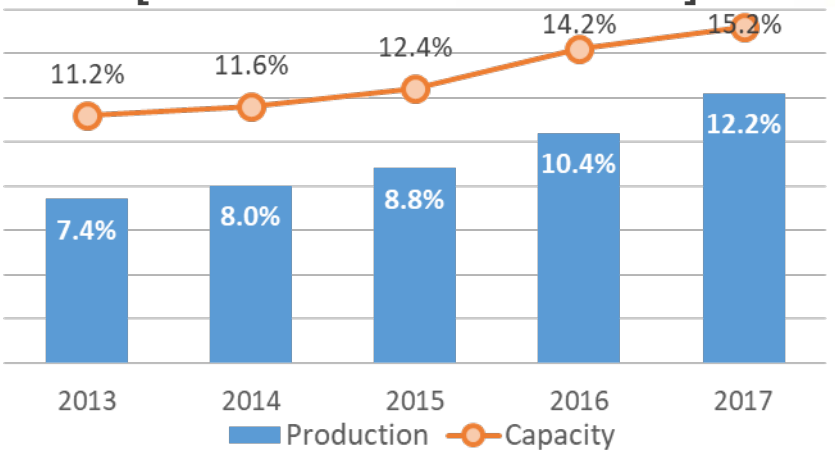
에너지경제연구원
Korea Energy Economics Institute

Distributed Power System

[Distributed Generation Target]



[Share of Distributed Generation]



Located nearby demand

- More fuel cells for power generation and CHP power plants

Electricity Prosumers

- More independent solar PV and residential/building fuel cells

Electricity Trading Market

- Virtual power plants for small distributed power, including solar PV, ESS and V2G

Participatory and Decentralized Governance

Better Communication · Public Participation

- Promotion of resident-participation and profit-sharing projects
- Systematic communication & conflict prevention processes (ex: ESTEEM model)

Role & Responsibility of Regional and Local Governments

- Zone planning system for renewable energy
- Enhancement of regional energy plans & establishment of regional energy centers

Energy Welfare

- Better energy welfare system for cooling in summer
- More efficient support system (ex. restructuring of the agency in charge)

에너지경제연구원
Korea Energy Economics Institute

Thank You.